(7) Press the **NORMAL SCREEN** Control Key.

s. Perform Low Flow adjustment as follows:

(1) Connect Flow Meter to ETCO2 Patient Port on the monitor front panel.

(2) Adjust AS191 R7 for a reading of 150 ml ±5 ml.

t. Set the ETCO2 to High Flow as follows:

(1) Turn the Rotary Knob to highlight the **ETCO2** icon.

(2) Press the Rotary Knob to select the **ETCO2** menu.

(3) Turn the Rotary Knob to highlight the **FLOW** menu selection.

(4) Press the Rotary Knob to select **FLOW**.

(5) Turn the Rotary Knob to highlight the **HIGH** menu selection.

(6) Press the Rotary Knob to select **HIGH**.

(7) Press the **NORMAL SCREEN** Control Key.

u. Perform High Flow adjustment by adjusting AS191 R4 for a reading of 230 ml ±5 ml.

v. Repeat substeps r, s, t and u as necessary.

w. Disconnect the Flow Meter from the ETCO2 port on the monitor front panel.

x. Perform ETCO2 Verification (Section II).

4.5 Respiration Adjustment Procedure. Perform the following procedure to adjust the Respiration System.

a. Remove top cover and front panel assembly (Reference Section III: Disassembly Procedures).

b. Turn on the monitor.

c. Press the **SETUP** Control Key.

d. Turn the Rotary Knob to highlight the **DISPLAY SETUP** menu selection.

e. Press the Rotary Knob to select **DISPLAY SETUP.**

f. Turn the Rotary Knob to highlight the **TRACE C** menu selection.

g. Press the Rotary Knob to select **TRACE C**.

h. Turn the Rotary Knob to highlight the **RESP** menu selection.

i. Press the Rotary Knob to select **RESP**.

j. Press the **NORMAL SCREEN** Control Key.

k. Turn the Rotary Knob to highlight the **RESP** window.

l. Press the Rotary Knob to select **RESP**.

m. Turn the Rotary Knob to highlight the **SIZE** menu selection.

n. Press the Rotary Knob to select **SIZE**.

o. Turn the Rotary Knob to highlight the **10 Ohm** menu selection.

p. Press the Rotary Knob to select **10 Ohm**.

q. Press the **NORMAL SCREEN** Control Key.

r. Set the Patient Simulator Respiration output to 3 Ohms at a rate of 30BPM with the Baseline Impedance set to 500 Ohms.

s. Disconnect the RA (white) and LA (black) leads from the Patient Simulator.

t. Using a DMM , set to measure "TRUE RMS AC CURRENT" with the range set to measure 90 uA AC (100 Ohm input impedance), connect the meter to the RA and LA leads and adjust AB99 R25 for 90 µA AC (±5µA). 2ma Scale on meter

CW ↑I
CCW ↓I

u. Reconnect leads to the patient simulator.

v. Connect a X10 scope probe to AB99 TP1 using AB99A GND as reference ground.

w. Set the scope controls to 50mv DC input coupling, 5µs/cm.

x. Adjust AB99 C15 and C22 for a minimum waveform (approximately) 1Vp-p (2 divisions) (**See Figure 4-2**) with equal negative peaks and correct phasing representing the positive portion of a sinusoidal waveform. Recheck steps s through w.

Figure 4-2. Respiration Waveform

y. Disconnect scope probe from TP1 and connect it to TP2.

z. Set the scope controls to 0.2V and input switch to ground. Adjust the scope baseline for 0VDC then change the switch back to DC input coupling.

aa. Adjust AB99 R23 for 6Vdc (3 divisions).

ab. Disconnect scope probe from TP2 and hold it on to AB99 P4 pin1.

ac. Set the scope controls to 50mv DC input coupling.

ad. Adjust AB99 R18 for 2.14 Vp-p (approximately 4.3 divisions).

ae. Remove scope probe.

af. Verify waveform on the display.

ag. Perform RESP Calibration Verification (Section II).

SECTION V

TROUBLESHOOTING FLOW CHARTS

Table of Contents

Failure Indication	Page Number
Monitor Will Not Power Up on Facility Line Power	5-2
Power Supply Test	5-3
Won't Power Up on Battery Power	5-4
No Display Backlight	5-5

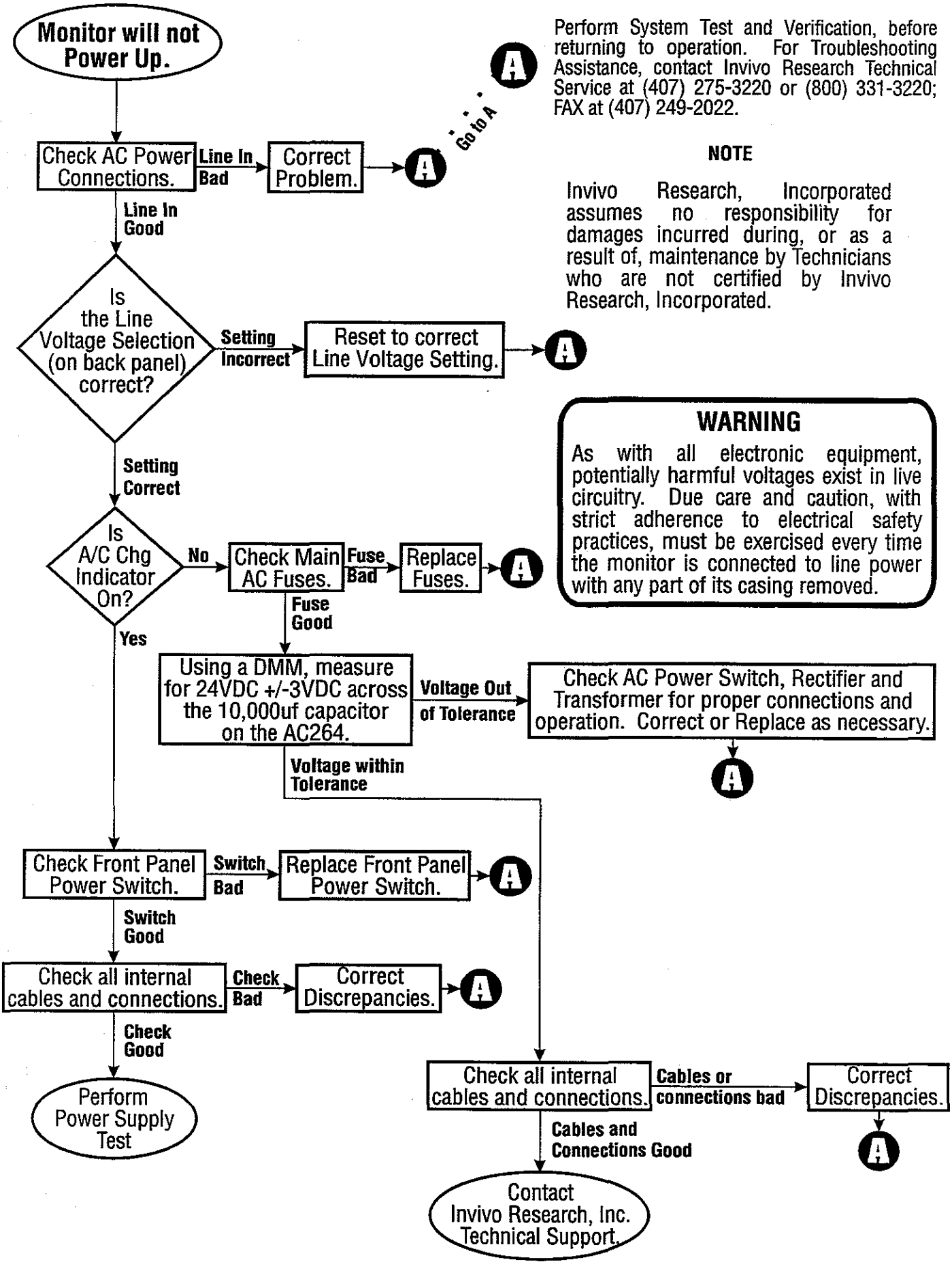
List of Symbols

Round or Oval: These symbols are used to provide information.

Square or Rectangle: These symbols are used when technician actions are required.

Diamond: This symbol is used when there is a decision for the technician to make.

Circled Letter: This symbol is used to move the technician from place to place on the Troubleshooting Charts.


Monitor will not Power Up.
Check AC Power Connections.
Line In Bad
Correct Problem.
A
Go to A
Line In Good
Is the Line Voltage Selection (on back panel) correct?
Setting Incorrect
Reset to correct Line Voltage Setting.
Setting Correct
Is A/C Chg Indicator On?
No
Check Main AC Fuses.
Fuse Bad
Replace Fuses.
Fuse Good
Yes
Using a DMM, measure for 24VDC +/-3VDC across the 10,000uf capacitor on the AC264.
Voltage Out of Tolerance
Check AC Power Switch, Rectifier and Transformer for proper connections and operation. Correct or Replace as necessary.
Voltage within Tolerance
Check Front Panel Power Switch.
Switch Bad
Replace Front Panel Power Switch.
Switch Good
Check all internal cables and connections.
Check Bad
Correct Discrepancies.
Check Good
Perform Power Supply Test
Check all internal cables and connections.
Cables or connections bad
Correct Discrepancies.
Cables and Connections Good
Contact Invivo Research, Inc. Technical Support.

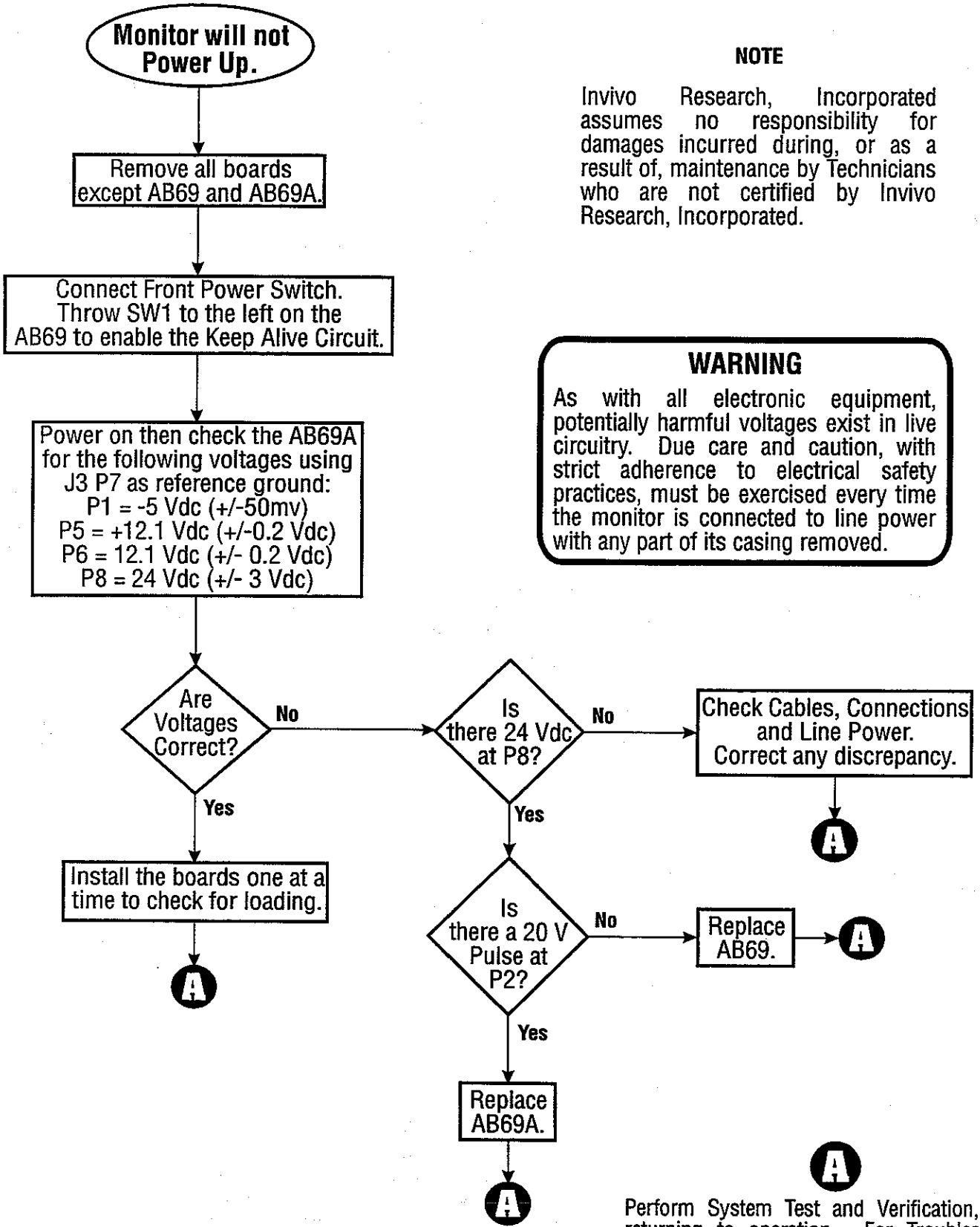
Perform System Test and Verification, before returning to operation. For Troubleshooting Assistance, contact Invivo Research Technical Service at (407) 275-3220 or (800) 331-3220; FAX at (407) 249-2022.

NOTE

Invivo Research, Incorporated assumes no responsibility for damages incurred during, or as a result of, maintenance by Technicians who are not certified by Invivo Research, Incorporated.

WARNING

As with all electronic equipment, potentially harmful voltages exist in live circuitry. Due care and caution, with strict adherence to electrical safety practices, must be exercised every time the monitor is connected to line power with any part of its casing removed.


Monitor will not Power Up.
Remove all boards except AB69 and AB69A.
Connect Front Power Switch. Throw SW1 to the left on the AB69 to enable the Keep Alive Circuit.
Power on then check the AB69A for the following voltages using J3 P7 as reference ground:
P1 = -5 Vdc (+/-50mv)
P5 = +12.1 Vdc (+/-0.2 Vdc)
P6 = 12.1 Vdc (+/- 0.2 Vdc)
P8 = 24 Vdc (+/- 3 Vdc)
Are Voltages Correct?
No
Yes
Is there 24 Vdc at P8?
No
Yes
Check Cables, Connections and Line Power. Correct any discrepancy.
A
Install the boards one at a time to check for loading.
A
Is there a 20 V Pulse at P2?
No
Yes
Replace AB69.
A
Replace AB69A.
A

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WARNING

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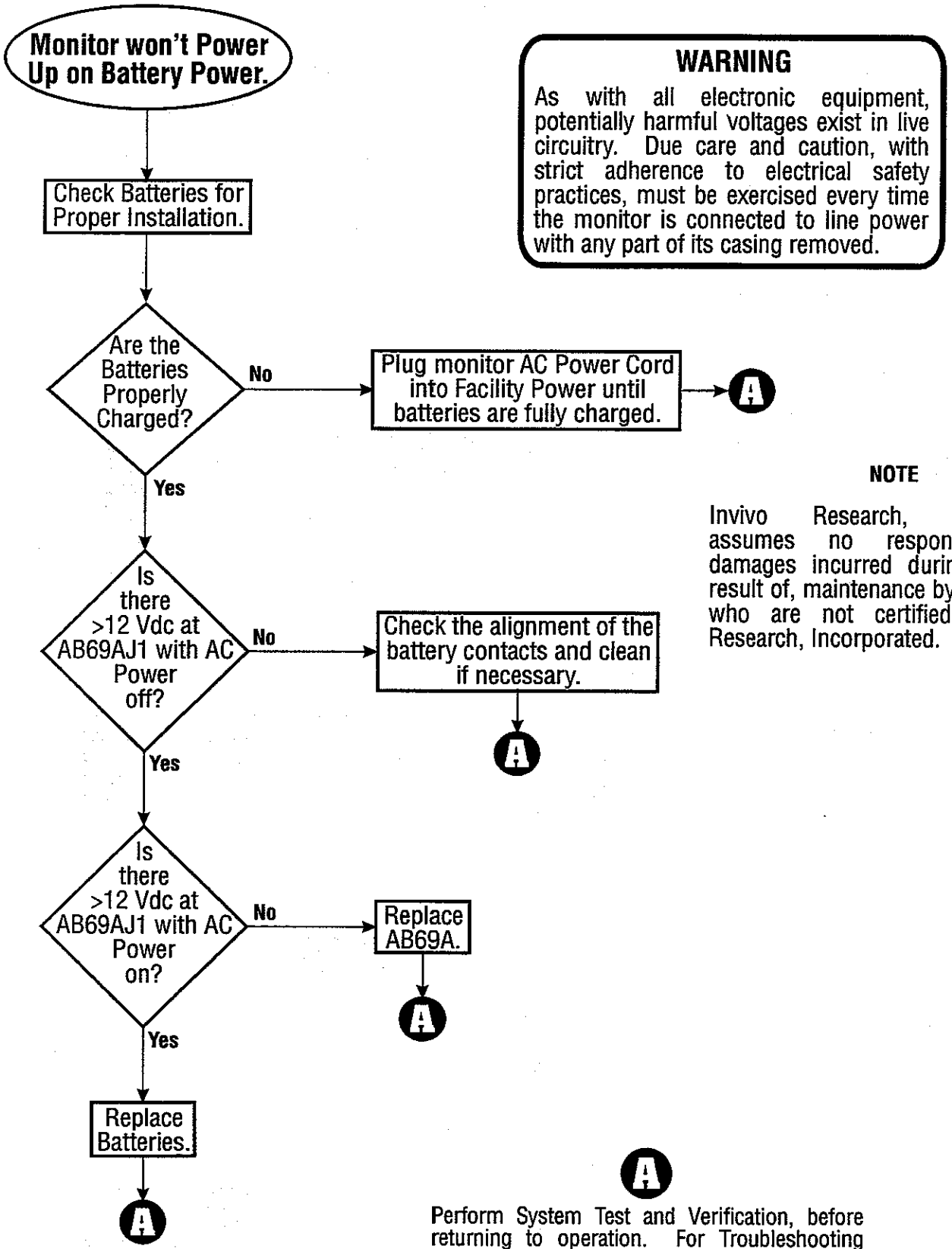
A

Perform System Test and Verification, before returning to operation. For Troubleshooting Assistance, contact Invivo Research Technical Service at (407) 275-3220 or (800) 331-3220; FAX at (407) 249-2022.



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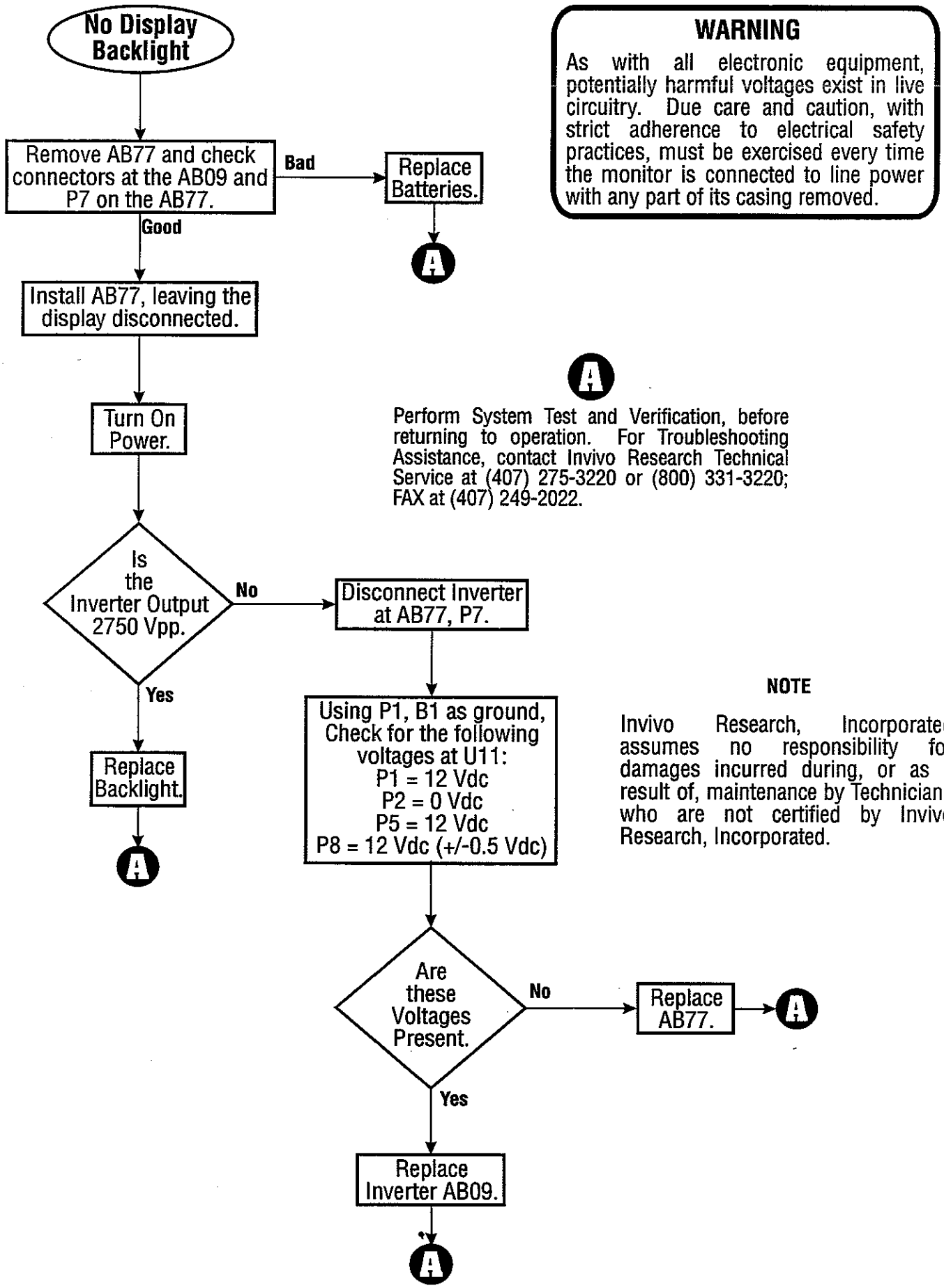
Perform System Test and Verification, before returning to operation. For Troubleshooting Assistance, contact Invivo Research Technical Service at (407) 275-3220 or (800) 331-3220; FAX at (407) 249-2022.


No Display Backlight
Remove AB77 and check connectors at the AB09 and P7 on the AB77.
Bad
Replace Batteries.
A
Good
Install AB77, leaving the display disconnected.
Turn On Power.
Is the Inverter Output 2750 Vpp.
No
Disconnect Inverter at AB77, P7.
Yes
Replace Backlight.
A
Using P1, B1 as ground, Check for the following voltages at U11:
P1 = 12 Vdc
P2 = 0 Vdc
P5 = 12 Vdc
P8 = 12 Vdc (+/-0.5 Vdc)
Are these Voltages Present.
No
Replace AB77.
A
Yes
Replace Inverter AB09.
A
WARNING
As with all electronic equipment, potentially harmful voltages exist in live circuitry. Due care and caution, with strict adherence to electrical safety practices, must be exercised every time the monitor is connected to line power with any part of its casing removed.
A
Perform System Test and Verification, before returning to operation. For Troubleshooting Assistance, contact Invivo Research Technical Service at (407) 275-3220 or (800) 331-3220; FAX at (407) 249-2022.
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Appendix A
Assembly and Schematic Drawings

Part Number	Dwg Nomenclature	Page Number
3500	Millennia Interconnect Diagram	A-2
3500	Millennia 3500 Vital Signs Monitor Assembly Diagram	A-3
AB09A	LCD Inverter (with Heat Shrink) Assembly Diagram	A-13
AB65	A/D Assembly Diagram	A-14
AB65	A/D Schematic Diagram	A-15
AB66	Patient Front End Assembly Diagram	A-20
AB66	Patient Front End Schmatic Diagram	A-23
AB68	Keyboard Interface Assembly Diagram	A-36
AB68	Keyboard Interface Schematic Diagram	A-37
AB69	Power Supply Assembly Diagram	A-38
AB69	Power Supply Schematic Diagram	A-39
AB69A	Power Switcher/Battery Charger Assembly Diagram	A-42
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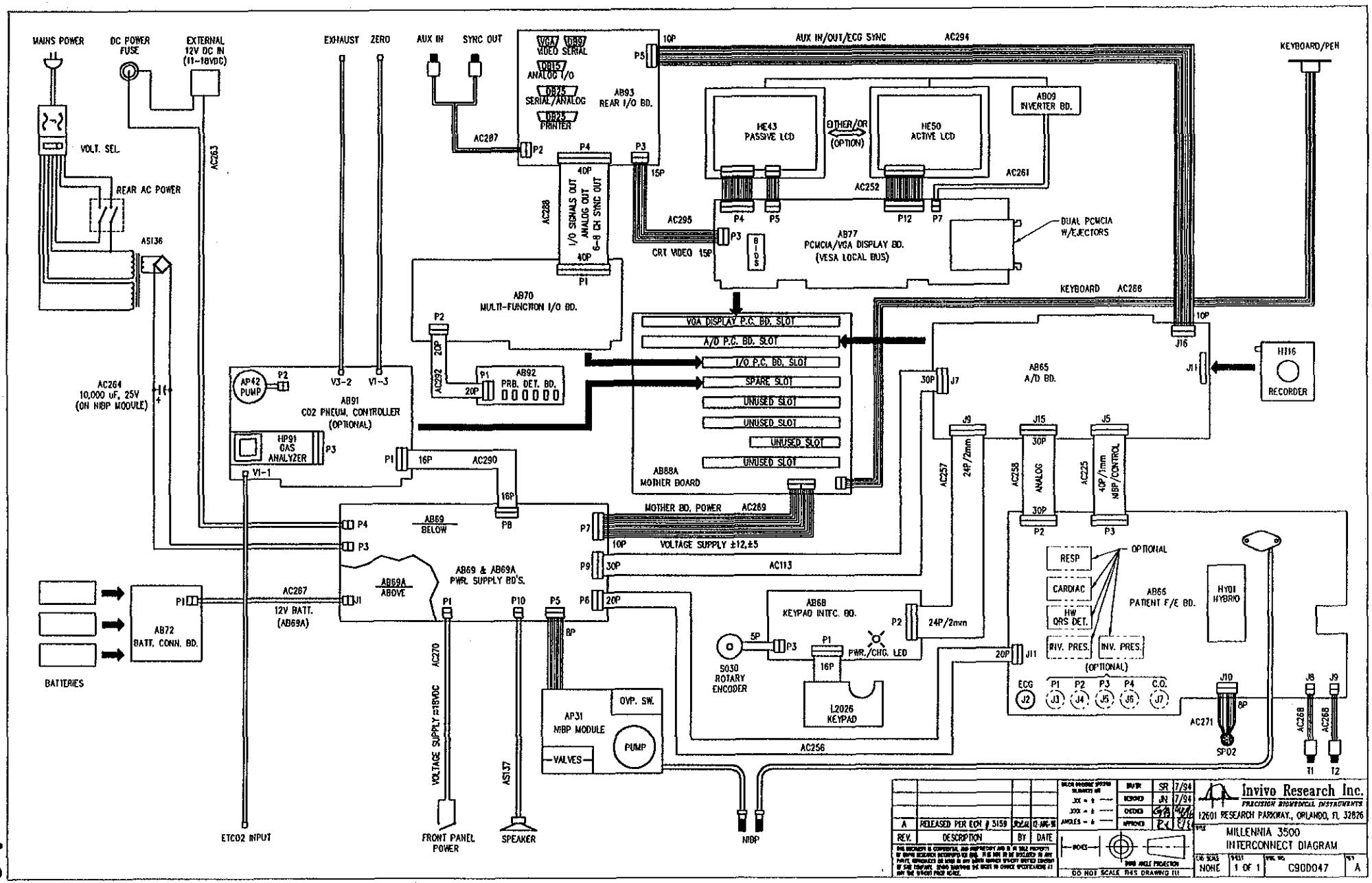
AB77	PCMCIA/VGA Display Schematic Diagram	A-54
AB91	ETCO2 Pneumatics Controller Assembly Diagram	A-56
AB91	ETCO2 Pneumatics Controller Schematic Diagram	A-57
AB92	Assy: PCA, Connector Sensor, 3500	A-59
AB92	Sch: Patient Connector Sensor, 3500	A-60
AB93	Assy: PCA, Rear Panel Connectors, 3500	A-61
AB93	Sch: PCA, Rear Panel Connectors, 3500	A-62
AB97	Assy: PCA, Sharp 321 LCD Display, Cable Adapter, 3500	A-63
AB97	Sch: PCA, Sharp 321 LCD Active Display, Cable Adapter, 3500	A-64
AB105	Assy: PCA, Sharp 35PX Passive Cable Adptr.	A-65
AB105	Sch: PCA, Sharp 35PX Passive Cable Adptr.	A-66
AS137	Assy: Speaker, 3500	A-67
AS191	Assy: End-Tidal CO2 Module	A-68


MAINS POWER
DC POWER FUSE
EXTERNAL 12V DC IN (11-18VDC)
VOLT. SEL.
REAR AC POWER
AS136
AC263
EXHAUST
ZERO
AUX IN
SYNC OUT
VGA VIDEO
DB9 SERIAL
DB15 ANALOG I/O
DB25 SERIAL/ANALOG
DB25 PRINTER
AB93 REAR I/O BD.
AC287
10P
AUX IN/OUT/ECG SYNC
AC294
KEYBOARD/PEN
ME43 PASSIVE LCD
EITHER/OR (OPTION)
ME50 ACTIVE LCD
AB09 INVERTER BD.
AC252
AC261
AC288
I/O SIGNALS OUT
ANALOG OUT
6-8 CH SYNC OUT
40P
15P
AC295
CRT VIDEO 15P
AB77 PCMCIA/VGA DISPLAY BD. (VESA LOCAL BUS)
DUAL PCMCIA W/EJECTORS
KEYBOARD AC266
AB70 MULTI-FUNCTION I/O BD.
AC292
20P
AB92 PRB. DET. BD.
VGA DISPLAY P.C. BD. SLOT
A/D P.C. BD. SLOT
I/O P.C. BD. SLOT
SPARE SLOT
UNUSED SLOT
UNUSED SLOT
UNUSED SLOT
UNUSED SLOT
AB88A MOTHER BOARD
AB65 A/D BD.
HI16 RECORDER
AC264 10,000 uF, 25V (ON NBP MODULE)
AP42 PUMP
AB91 CO2 PNEUM. CONTROLLER (OPTIONAL)
V3-2
V1-3
V1-1
HP91 GAS ANALYZER
16P
AC290
AC257
24P/2mm
AC258
ANALOG
AC225
40P/1mm
NBP/CONTROL
MOTHER BD. POWER AC269
VOLTAGE SUPPLY ±12,±5
AC113
AB69 BELOW
AB69A ABOVE
AB69 & AB69A PWR. SUPPLY BD'S.
AC267
12V BATT. (AB69A)
AB72 BATT. CONN. BD.
BATTERIES
AB68 KEYPAD INTFC. BD.
S030 ROTARY ENCODER
L2026 KEYPAD
PWR./CHG. LED
RESP
CARDIAC
HW ORS DET.
OPTIONAL
AB66 PATIENT F/E BD.
HY01 HYBRID
INV. PRES.
(OPTIONAL)
ECG
C.O.
AC271
SPO2
AC268
T1
T2
AC270
VOLTAGE SUPPLY +18VDC
AS137
SPEAKER
FRONT PANEL POWER
ETCO2 INPUT
AP31 NBP MODULE
OVP. SW.
PUMP
VALVES
AC256
NBP
A RELEASED PER ECN # 3159 SR 7-AUG-96
REV. DESCRIPTION BY DATE
DRAWN SR 7/94
ENGRD JN 7/94
CHECKED
APPROVED
DO NOT SCALE THIS DRAWING !!!
Invivo Research Inc.
PRECISION BIOMEDICAL INSTRUMENTS
12601 RESEARCH PARKWAY, ORLANDO, FL 32826
MILLENNIA 3500
INTERCONNECT DIAGRAM
UNLESS NOTED NONE
SHEET 1 OF 1
DWG. NO. C90D047
REV A

White Display Larger connector.

No Display Small conn.

Need 3 lead ECG cable For dual ECG Display

pull batteries when sending in For repair

3	Fully charged Batteries	90 min. operation on NIBP Leak Test
1	Battery	15 min.